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10/557,281

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EXAMINER

VINH, LAN

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|--------------------------------------|--|
| Office Action Summary | Application No. 10/557,281 | Applicant(s) MIZE, JOHN D. | |
| | Examiner LAN VINH | Art Unit 1792 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5,7 and 9-27 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 16-27 is/are allowed.
- 6) ☒ Claim(s) 1-3,5, 7, 9-11, 14-15 is/are rejected.
- 7) ☒ Claim(s) 12 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments/Amendment

1. The applicants argue that the cited references of Nakabayashi/Takahashi does not disclose that the component comprises a tantalum coil and that the deposited layer comprises TaN deposited on the coil surface. This argument has been considered and is persuasive. Therefore, the rejection of claims 1-3 under 35 U.S.C 102(b) based on Nakabayashi/ claims 1-3, 9, 11, 15 under 35 U.S.C 102(e) based on Takahashi has been withdrawn. However, upon further consideration, a new ground(s) of rejection of claims 1-3 under 35 U.S.C 103(a) as being unpatentable over Nakabayashi/Takahashi in view of the newly cited reference of Arunachalam et al (US 6,500,315). In addition, the indicated allowability of claim 6 is withdrawn in view of the newly discovered reference(s) to Arunachalam et al (US 6,500,315). New ground of rejections based on the newly cited reference follow.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 7 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 recites the limitation "the interior surfaces" in claim 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakabayashi et al (US 2002/0033381) in view of Arunachalam et al (US 6,500,315). Nakabayashi disclose a surface processing method comprises the steps of providing a used PVD component having a layer deposited on a component surface (page 1, paragraphs 0002, 0004) first etching the deposited layer using a first acid-comprising etchant (page 3, paragraph 0051,0068) after the first etching, entraining abrasive particles in a flow of gas, impinging the particles on the etched layer, and abrading the etched layer (page 3, paragraph 0054) after the abrading, second etching the abraded layer using a second acid- comprising etchant.(page 3, paragraph 0059, 0068)

Unlike the instant claimed invention as per claim 1, Nakabayashi fails to specifically disclose that the used component comprises a tantalum coil and the deposited layer comprises TaN deposited on the coil surface during PVD use

Arunachalam discloses a method for forming a layer (TaN) in a PVD chamber, the chamber includes a tantalum coil (col 7, lines 5-64), which reads on the component comprises a tantalum coil and the deposited layer comprises TaN deposited on the coil

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surface during PVD use since the applicants disclose in paragraph 0003 of the instant specification that “ PVD components, including PVD coils, may accumulate layers of material deposited on the component surface during their use in PVD. The layers may contain the material being deposited by PVD or, possibly, some derivative thereof.

Accumulation of the layers can increase the generation of contaminant particles during PVD and/or may impair operation of the PVD apparatus. Accordingly, accumulation of the layers may be monitored so that the component can be removed and discarded after reaching its usage limit. At such time, the removed component may be replaced with a new component. Replacing components manufactured from costly materials, for example tantalum, increases the cost of performing PVD”

One skilled in the art at the time the invention was made would have found it obvious to have employed Arunachalam's tantalum coil in Nakabayashi PVD chamber to deposit a TaN layer since Arunachalam discloses that the coil (tantalum) provides a variety of functions during the IMP-PVD deposition and the PVD is commonly used to deposit conductive metal and metal-containing films on the semiconductor substrate (col 1, lines 15-28)

Regarding claim 2, since Nakabayashi as modified by Arunachalam discloses the same steps performed in the same sequence using the same etchant as the claimed invention, the first etching, the abrading, and the second etching in Nakabayashi and Arunachalam method would have removed the deposited layer at a rate greater than the same. first etching and the same second etching performed without the abrading.

Regarding claim 3, since Nakabayashi as modified by Arunachalam discloses the same

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steps performed in the same sequence using the same etchant as the claimed invention, the first etching, the abrading, and the second etching in Nakabayashi and Arunachalam method would have removed less of the PVD component surface than occurs in removing an equivalent thickness of the deposited layer by extending the abrading and performing the same second etching without the first etching

4. Claims 1-3, 9, 11, 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al (US 6902814) in view of Arunachalam et al (US 6,500,315).

Takahashi discloses a process for producing ceramic part. The process comprises the steps of:

providing a quartz part/used PVD component having a layer deposited on a component surface (col 9, lines 35-42; see abstract)

rinsing the part in an solution comprises of nitric acid and HF to reduce the NA content of the surface from several ten minutes (col 9, lines 42-45), which reads on first etching the deposited layer using a first acid-comprising etchant (col 9, lines 43-45)

after the first etching, entraining abrasive particles in a flow of gas, impinging the particles on the etched layer, and abrading the etched layer (col 9, lines 55-60)

after the abrading, second etching the abraded layer using a second HF-acid-comprising etchant.(col 9, lines 60-65)

Unlike the instant claimed invention as per claim 1, Takahashi fails to specifically disclose that the used component comprises a tantalum coil and the deposited layer comprises TaN deposited on the coil surface during PVD use

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Arunachalam discloses a method for forming a layer (TaN) in a PVD chamber, the chamber includes a tantalum coil (col 7, lines 5-64), which reads on the component comprises a tantalum coil and the deposited layer comprises TaN deposited on the coil surface during PVD use since the applicants discloses in paragraph 0003 of the instant specification that “ PVD components, including PVD coils, may accumulate layers of material deposited on the component surface during their use in PVD. The layers may contain the material being deposited by PVD or, possibly, some derivative thereof. Accumulation of the layers can increase the generation of contaminant particles during PVD and/or may impair operation of the PVD apparatus. Accordingly, accumulation of the layers may be monitored so that the component can be removed and discarded after reaching its usage limit. At such time, the removed component may be replaced with a new component. Replacing components manufactured from costly materials, for example tantalum, increases the cost of performing PVD”

One skilled in the art at the time the invention was made would have found it obvious to have employed Arunachalam's tantalum coil in Takahashi PVD chamber to deposit a TaN layer since Arunachalam discloses that the coil (tantalum) provides a variety of functions during the IMP-PVD deposition and the PVD is commonly used to deposit conductive metal and metal-containing films on the semiconductor substrate (col 1, lines 15-28)

Regarding claim 2, since Takahashi and Arunachalam discloses the same steps performed in the same sequence using the same etchant as the claimed invention, the first etching, the abrading, and the second etching in Takahashi and Arunachalam

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method would have removed the deposited layer at a rate greater than the same. first etching and the same second etching performed without the abrading.

Regarding claim 3, since Takahashi and Arunachalam discloses the same steps performed in the same sequence using the same etchant as the claimed invention, the first etching, the abrading, and the second etching in Takahashi and Arunachalam method would have removed less of the PVD component surface than occurs in removing an equivalent thickness of the deposited layer by extending the abrading and performing the same second etching without the first etching. The limitations of claims 9, 11 have been discussed above.

Regarding claim 15, Takahashi discloses that the process produces Ra of 20 micronm (784 micronin)>300 micronin (col 9, lines 57-59)

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakabayashi et al (US 2002/0033381) in view of Arunachalam et al (US 6,500,315) and further in view of EP 1178133

Nakabayashi as modified by Arunachalam has been described above. Unlike the instant claimed invention as per claim 5, Nakabayashi and Arunachalam fails to disclose that the component is RF coil in PVD reactor/metal

EP 1178133 discloses a method for extending life of metallic coil/component of processing chamber by etching (col 4, paragraph 0019)

Since Nakabayashi concerns with a method for cleaning used chamber component (page 1, paragraph 0015), ones skilled in the art would have found it obvious to have

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employed Nakabayashi and Arunachalam method to process the components taught in EP 1178133 in order to prevent generation of contaminant as taught in Nakabayashi (page 1, paragraph 0015)

6. Claims 10, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakabayashi et al (US 2002/0033381) in view of Arunachalam et al (US 6,500,315) and further in view of Banholzer et al (US 5,565,058)

Nakabayashi as modified by Arunachalam has been described above. Unlike the instant claimed inventions as per claims 10, 14, Nakabayashi and Arunachalam fails to disclose wherein the first and second etchants are the same etchant that, aside from processing impurities, consists of a mixture of equal volumetric parts deionized water, HF, and HNO₃

Banholzer discloses a pretreatment method for vacuum chamber component comprises the step of cleaning/etching the component with a solution consists of a mixture of equal volumetric parts deionized water, HF, and HNO₃ (col 4, lines 5-10), abrading comprises bead blasting with 36-80 grit alumina (col 3, lines 1-5)

One skilled in the art at the time the invention was made would have found it obvious to modify Nakabayashi and Arunachalam method by using a solution consists of a mixture of equal volumetric parts deionized water, HF, and HNO₃ in the first and second etching step in view of Banholzer teaching because Banholzer discloses that prior to bead blasting step the part are chemically cleaned with a solution consists of a mixture of equal volumetric parts deionized water, HF, and HNO₃ to remove surface

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contamination such as oxide (col 4, lines 1-10). One skilled in the art at the time the invention was made would have found it obvious to employ 36-80 grit alumina in Nakabayashi and Arunachalam blasting step as conventional in the art as evidenced by Banzoler (col 3, lines 1-5).

Allowable Subject Matter

7. Claims 16-27 allowed. The reasons for allowance of claims 16, 25 have been stated in the previous office action

Claim 7 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 7, the cited prior art of record fails to disclose a used PVD refurbishing method comprises a limitation of wherein the coil comprises mounting bosses with interior surfaces and the method further comprises protecting the interior surfaces during the first etching and the abrading, but not during the second etching, in combination with the rest of the limitations of claim 7

Claims 12-13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 12, the cited prior art of record fails to disclose a used PVD refurbishing method comprises a limitation of

wherein the second etching produces bubbling, reaching a maximum rate, and the second etching proceeds until the bubbling rate decreases to less than about 10% of the maximum rate, in combination with the rest of the limitations of claim 12

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAN VINH whose telephone number is (571)272-1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Lan Vinh/

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